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Liquids/Slurry Pipelines Report

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International Pipeline & Gas Utility Design, Construction & Operation

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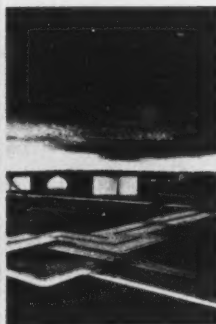
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COVER

This graphic reminder—a sunset view of a major products pipeline terminal—serves as a reminder that the crude oil and products pipelines in the U.S. are the backbone of an energy transportation system that helps insure the economic viability of the U.S.

—photo courtesy Williams Pipe Line Co.

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Construction Forecast

Forecast: Inter-Regional Pipelines		
	1981-1990 Miles	1991-2000 Miles
Gas	11,800	14,200
Crude/Synfuel Oil	5,100	3,800
Coal Slurry	7,700	7,700
Products	2,200	1,000
Carbon Dioxide	2,000	5,000
Total	28,800	31,700
Average Per Year	2,880	3,170

Fig. 1.

Forecast: Energy Demand, Production MMBbl/day						
	Coal	Oil	Gas	Shale	Other	Total
1980						
Demand	8	16	9		3	36
Net Exports (Imports)	1	(6)	(1)		—	(6)
U.S. Production	9	10	8		3	30
1990						
Demand	10	14	9		6	39
Net Exports (Imports)	3	(4)	(1)		—	(2)
U.S. Production	13	10	8		6	37
2000						
Demand	16	13	10		8	47
Synfuel Conversion	2	(3)	(1)	2	—	—
Net Exports (Imports)	4	(1)	(1)	—	—	2
U.S. Production	22	9	8	2	8	49

Fig. 2.

Pipeline Needs Forecast For 1981-2000 Period

by **Peter G. Behr**, Vice President and General Manager, Pipeline and Production Facilities Division,
and **Stephen T. Davenport**, Manager, Pipelines, San Francisco Office,
Bechtel Petroleum, Inc., Houston, Texas

Forecasting pipeline construction 20 years into the future is an art, not a science. This article does not pretend to give an accurate forecast of the actual pipelines that will be constructed over the next 20 years, but does show an interesting approach to how such a forecast can be prepared.

A summary of our forecast for new "inter-regional" pipeline construction is shown in Fig. 1. Regional pipelines normally represent approximately two times the mileage of inter-regional pipelines, but we have not included a forecast for the regional pipelines. Distribution and field gathering lines are also excluded from the forecast.

It is hoped that readers will not put too much emphasis on the detailed results of our forecast, but instead will consider the trends that may develop, and the effects of energy demand and production on the future needs for new pipelines.

The method used to develop this forecast is based on:

- ✓ forecasting the total energy demand for the United States.
- ✓ forecasting where the various types of energy such as coal, petroleum, natural gas, and shale will be produced.

- ✓ forecasting the new inter-regional pipeline transportation requirements.

- ✓ and then forecasting the pipelines required to transport these products to the demand centers.

Time restrictions prevented us from forecasting the Canadian energy demand and production picture in the same detail as for the U.S. It was assumed that Canadian demand would increase at approximately the same rate as that predicted for the U.S. Pipeline construction in Canada will be needed both for serving the Canadian domestic market, and for transporting Alaskan and Canadian Arctic gas to the United States.

Our forecasts for energy demand and production rely heavily on forecasts published by others. Where we found conflicting forecasts, or no solid data was available, we developed our own projections.

The resulting forecasts reflect a strong growth in coal production to serve both domestic consumption and the rapidly growing coal export market. The forecasts also reflect a rapidly growing synthetic fuel industry, and successful prospecting for oil and gas in the Mountain area and in the Arctic. Oil

and gas production in the Gulf region was forecast to decline, as old reserves are depleted faster than they are replaced.

In the event that new reserves continue to be discovered to maintain historic production rates in the Gulf region, then perhaps our forecast of total U.S. oil and gas production is too conservative, and oil imports will decline even faster than predicted.

Energy Forecast

Forecasting energy demand and production is the key element in this long-range pipeline forecast. Fig. 2 shows a summary of our forecast of U.S. energy demand and production expressed in millions of barrels per day of oil equivalent. We find that it is difficult to get a consensus from forecasters who represent different areas of expertise such as nuclear power, solar power, synthetic fuel technology, etc. This is a "pipelines" forecast, "subject to change without notice."

Rapidly changing rates of consumption of energy make forecasting particularly difficult at this time. Most published energy demand forecasts made only two years ago for the year

Forecast: Energy Demand, Production, % Change/Yr

	Coal	Oil	Gas	Shale	Nuclear & Other	Elect.	Total
1980-1990							
Household & Commercial	—	(3)	1	—	2	1.0	
Industrial	3	(6)	2	—	4	1.5	
Transportation	—	—	—	—	—	—	
Electric Generation	3	(3)	(4)	—	7	3	2.9
Total Demand	3	(2)	—	—	7	3	1.0
Total Production	5	(1)	—	—	7	3	2.1
1990-2000							
Household & Commercial	3	(4)	1	—	7	3	1.5
Industrial	3	(4)	1	—	2	1.5	
Transportation	—	1	—	—	10	1.0	
Electric Generation	3	(7)	(1)	—	3	2	2.4
Total Demand	3	(1)	1	—	3	2	1.8
Synfuel Conv.	21	20	22	19	—	—	
Total Production	5	—	—	—	3	2	2.8

Fig. 3.

2000 have been revised downward by about 30% in recent projections. What was forecast for energy consumption by 1990 has been moved out to the year 2000. The marked conservation of energy since the recent price rises has caught most forecasters by surprise.

Fig. 3 shows the percentage change per year used in preparing this forecast. Factors used in the forecast reflect the following:

- ✓ Stabilization in oil and gas demand and production in the United States.
- ✓ An increase in coal production at a rate of nearly 5% per year.
- ✓ The start of synthetic oil and gas production from coal and shale in the 1980s with a rate of increase of some 20% per year in the 1990s.
- ✓ An overall rate of increase of energy demand of 1% per year in the United States during the 1980s, becoming approximately 2% per year in the 1990s.

- ✓ An overall increase in energy production in the U.S. by 2% to 3% per year during the same period based on increased production of coal, shale oil, and nuclear power.

Our original forecast was prepared using the units of Quadrillion Btu's, which is the best method of forecasting when comparing your own forecast to those produced by others. But it is not a good basis for thinking about the production of oil, gas, or coal. Using a computer, we converted the forecast into units of equivalent natural gas, oil, and coal. These conversions were made using 5.8 MMBtu per bbl of oil equivalent, 1 MMBtu per Mcf of gas equivalent, and 22 MMBtu per short ton of coal equivalent.

Another interesting unit in which energy forecasts can be presented is in Gallons per Person per Day of Oil Equivalent. Fig. 5 shows our forecast in these units.

Forecast: Energy Demand and Production

	Coal MMSTY	Oil MMBD	Gas MMCFD	Shale MMBD	Nuclear & Other MMBD	Total MMBD
1980						
Demand	722	16	54	—	3	36
Net Exports (Imports)	86	(6)	(3)	—	—	(6)
U.S. Production	808	10	51	—	3	30
2000						
Demand	1540	13	62	—	8	47
Synfuel Conversion	227	(3)	(8)	2	—	—
Net Exports (Imports)	341	(1)	(7)	—	—	2
U.S. Production	2108	9	47	2	8	49

Fig. 4.

Forecast Of Production

U.S. oil production for the year 2000 has been forecast at 8.7 million bbl per day. Fig. 6 shows how this production forecast has been allocated by regions between production from "old" 1980 reserves and "new" 1981-2000 discoveries, extensions, and revisions. This is the most difficult part of the forecasting work, since very little data is available on anticipated oil and gas production by region.

To complete the forecast, it is necessary to make a distribution. We predicted the depletion of "old" reserves, as dictated by the remaining life of the reserves. And we predicted a relatively rapid discovery rate of new reserves in the Mountain region and in the Arctic.

To arrive at total oil production, we added synthetic oil produced from shale and other sources, with the majority of this production being allocated to the

Forecast: Gas Production, Bcf/Day

	Gulf	Alaska	Mountain	Other	Total
1980					
U.S. Production	36	1	5	9	51
Imports	—	—	—	—	3
Total Demand	—	—	—	—	54
2000					
Production From "Old" Reserves	6	3	1	1	11
Production From "New" Discoveries, Extensions & Revisions	17	2	9	8	36
	23	5	10	9	47
Synthetic Gas	—	—	2	6	8
Imports	—	—	—	—	7
Total Demand	—	—	12	15	62

Fig. 7.

Forecast: Coal Production, MMTons/Yr

	Transport Method					Total
	Rail or Local	Slurry Pipeline	Synfuel Oil Pipeline	Synfuel Gas Pipeline		
1980						
	803	5	—	—	—	808
2000						
Eastern Region	985	93	33	50	—	1161
Mountain Region	451	190	50	75	—	766
Synfuel Loss	181	—	—	—	—	181
Total	1617	283	83	125	—	2108

Fig. 8.

Forecast: Energy Demand, Gal/Person/Day Oil Equiv.

	Coal	Oil	Gas	Nuclear & Other	Elect.	Total
1980 (220 Million People)						
Household & Commercial	—	0.6	0.7		1.3	2.6
Industrial	0.3	0.6	0.7		0.9	2.5
Transportation	—	1.6	0.1		—	1.7
Electric Generation	1.1	0.3	0.3	0.5	(2.2)	—
Total Demand	1.4	3.0	1.8	0.5	—	6.8
2000 (240 Million People)						
Household & Commercial	—	0.3	0.8	0.1	1.9	3.1
Industrial	0.6	0.2	0.9	—	1.5	3.2
Transportation	—	1.6	0.1	—	—	1.7
Electric Generation	1.9	0.1	0.1	1.3	(3.4)	—
Total Demand	2.5	2.2	1.9	1.4	—	8.0

Fig. 5.

Forecast: Oil Production, MMBbl/Day

	Gulf	Alaska	Mountain	Other Oil	Gas Liquids	Total
1980						
U.S. Production	4.2	1.6	0.8	2.1	1.3	10.0
Imports						6.0
Total Demand						16.0
2000						
Production From "Old" Reserves	0.6	0.5	0.1	0.3	0.5	2.0
Production From "New" Discoveries, Extensions & Revisions	1.3	1.5	1.3	1.7	0.9	6.7
Synthetic Oil	1.9	2.0	1.4	2.0	1.4	8.7
Imports	—	—	2.5	0.3	—	2.8
Total Demand	—	—	—	—	—	0.7
			3.9	2.3		12.2

Fig. 6.

Mountain region.

Fig. 7 shows the same allocation for natural and synthetic gas production. Again, our allocation shows a drop in production in the Gulf region, and a rapid build-up of production in the Mountain region and Alaska.

Fig. 8 shows the same type of allocation for coal production between "Eastern" and "Mountain" regions. This figure also shows the delivery of coal to market by rail, slurry pipeline, or by oil or gas pipeline as synthetic fuels. If our forecast of production is right, there should be plenty of business for both the railroads and the pipeline industry in the next 20 years.

Forecast Of New Pipelines

The last step in the forecast was to predict the pipeline construction requirements for the period 1981-2000. To do this, we reviewed the data developed previously on energy demand and pro-

duction, and derived the requirements for new throughput capability. Figure 9 shows the summary of inter-regional pipeline transportation requirements that was developed.

For the actual forecast of pipeline construction, we developed a computer program capable of listing individual pipelines and calculating summaries of their length, cost, throughput, and weighted average diameter. We listed all the plans for pipelines found in the press, and then discounted them by a percentage to reflect the fact that not all pipelines planned get built. The total throughput volume of the planned pipelines was then compared to the throughput requirements found from the energy forecast. For regions where additional pipeline capacity was needed, new "unidentified" pipelines were added to make up the total throughput volume needed for the region.

Summary And Conclusions

Based on the assumptions, and using the forecasting method described in this paper, we have reached the following conclusions regarding the future of pipeline construction activity for transmission pipelines in the U.S. and Canada over the next 20 years:

- ✓ Gas pipeline activity will be highlighted by new pipelines from the Alaskan and Canadian Arctic, and new gas pipelines from the Mountain region will be built to serve synthetic gas conversion plants and new natural gas discoveries (Fig. 11).
- ✓ Crude oil pipeline activity will decline as the consumption of oil in the United States stabilizes. New lines will be built to serve the Canadian Arctic and the synthetic oil plants in the Mountain region (Fig. 12).
- ✓ Products pipeline activity will also decrease as the consumption of petroleum products stabilizes.

Forecast: New Inter-Regional Pipeline Requirements

	1981-2000
Gas (MMcfd)	
From Alaska	4000 MMcfd
From Mountain Area	7000 MMcfd
From Canadian Arctic	4000 MMcfd
Oil (MMbd)	
From Mountain Area	3100 Mbd
From Canadian Arctic	300 Mbd
Coal Slurry (MMsty)	
From Mountain Area	190 MMsty
From Eastern Area	93 MMsty

Fig. 9.

Forecast: Energy Imports, Exports, BBl/Day Oil Equiv.

1980	
Demand	36,000,000
Production	30,000,000
Net Imports	6,000,000
2000	
Production	49,000,000
Demand	47,000,000
Net Exports	2,000,000

Fig. 10.

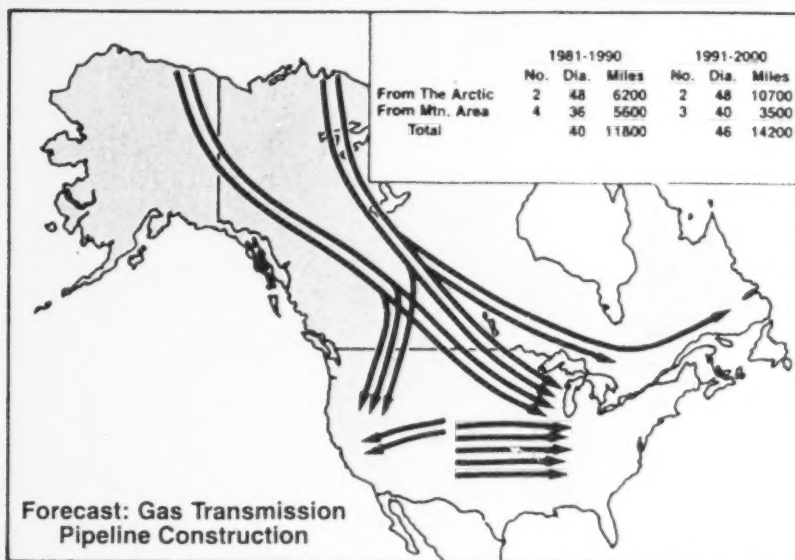


Fig. 11.

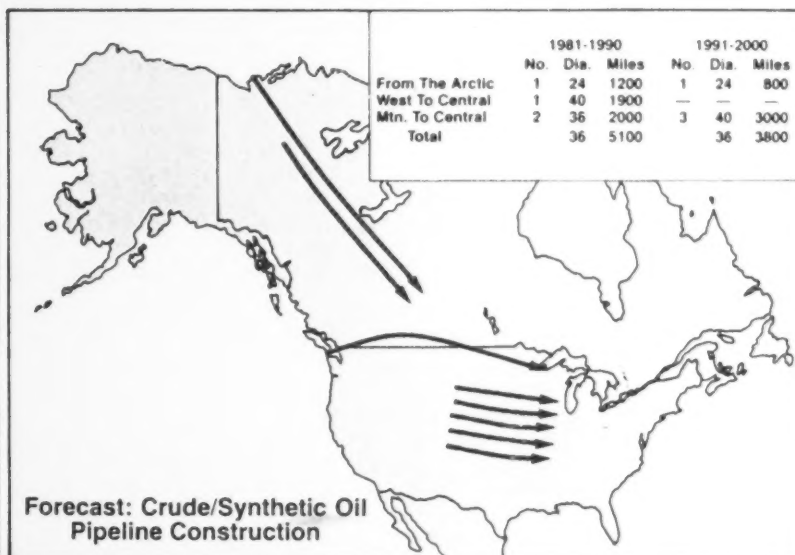


Fig. 12.

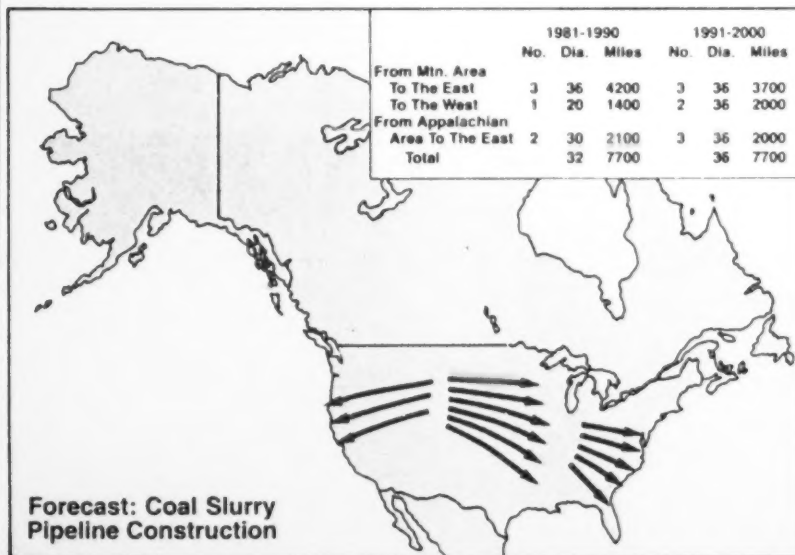


Fig. 13.

- ✓ Coal slurry pipeline construction will be a bright spot in the future of U.S. pipeline construction, making up 25% of the inter-regional pipeline construction. These pipelines will serve both U.S. electric generation plants and the rapidly expanding export market for coal. Even with the projected pipeline construction, railroads will be rapidly increasing their coal hauling activities (Fig. 13).
- ✓ Pipelines carrying carbon dioxide from underground reservoirs and from synthetic fuel plants to old oil fields for enhanced recovery purposes will add to the total pipeline picture.
- ✓ And remember if our projections prove to be correct, the U.S. will be a net exporter of energy by the year 2000 (Figure 13). That is a worthwhile goal for the energy industry.

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About The Authors



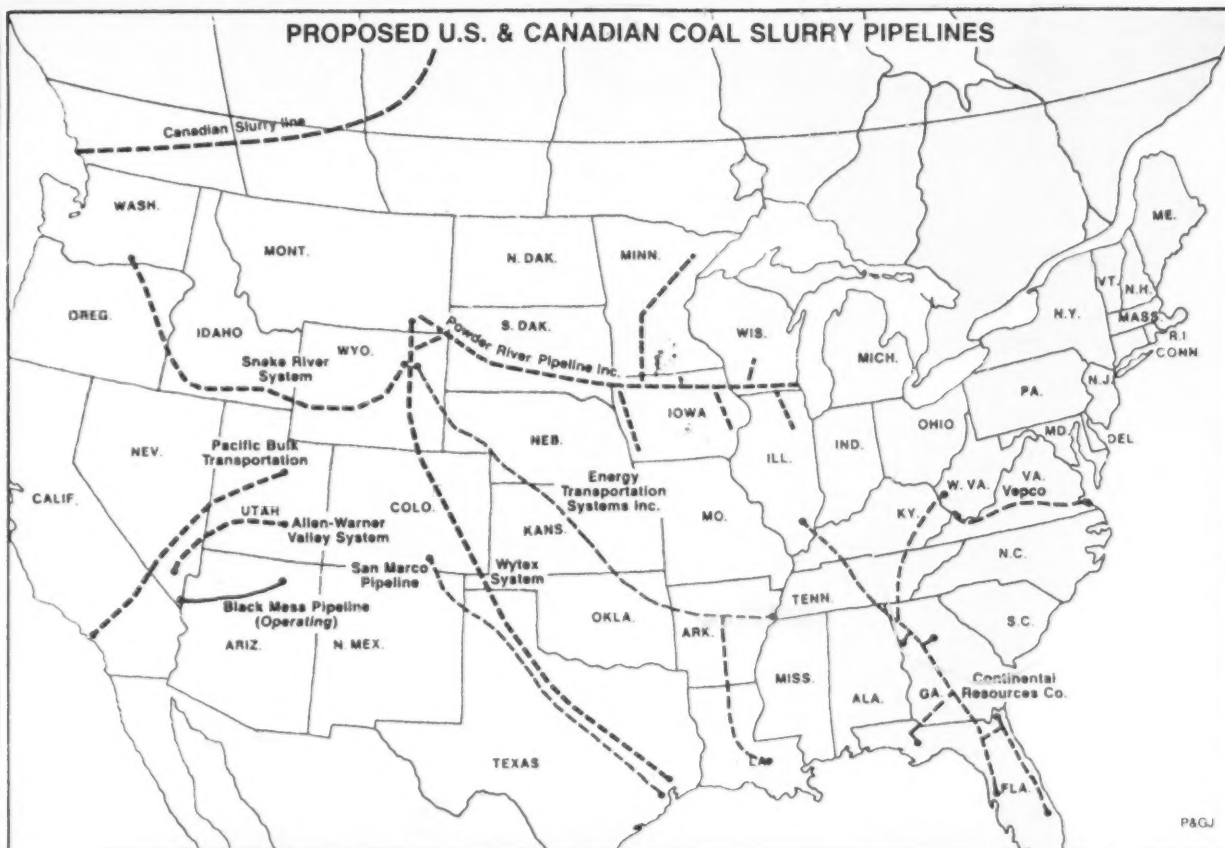
Behr



Davenport

Peter G. Behr is vice president of Bechtel Petroleum Inc. and general manager of its Pipeline and Production Facilities Division in Houston. During his 25 years with Bechtel, Behr has had broad engineering, construction, and management experience in the U.S. and overseas. He joined Bechtel's Pipeline Division in 1955 as an engineer, subsequently worked on the Trans-Arabian Pipeline, in North Africa, and in the Paris office. In 1967 he was named manager of European, North African, and Middle East operations. He is a native of Fresno, Calif., and holds a B.S. degree in mechanical engineering from Stanford University. He is a licensed professional engineer and a member of ASME.

Stephen T. Davenport has more than 30 years experience as an engineer in the pipeline business. A graduate of MIT with a degree in mechanical engineering, he worked with Aramco, Trans-Arabian Pipeline, and Standard Oil of California before joining Bechtel's Pipeline Division. He has participated in the engineering and construction of major pipelines in Europe and, since returning to the U.S., has managed the economics group, engineering department, and business development department of Bechtel's Pipeline Division. He is presently an executive engineer in Bechtel Petroleum Inc.



With Favorable Law Likely, Slurry Line Projects Expanding

by Dean Hale, Editor

Interest in coal slurry pipelines continues to mount and supporters of coal slurry pipeline projects are looking optimistically at Washington and new efforts to obtain Congressional approval on a bill that would give coal slurry lines the same right of *eminent domain* as that granted to natural gas pipelines.

A bill providing that right is being introduced by the Public Works and Transportation Committee in the House of Representatives, headed by committee chairman James J. Howard (D-N.J.). Terms of the bill, under formulation for some time, would include very protective language to protect the water rights of the various states; legal rights to water and access to water would not be a part of the legislation.

The new bill is not just a "western states" bill, emphasizes a spokesman for the Slurry Transportation Association, the industry's legislative watchdog in the nation's capitol. Considerable interest has been generated on the East Coast in favor of slurry pipelines, which are considered to have great potential for moving coal from mines to coastal

terminals, permitting the U.S. coal industry to more effectively participate in the export coal market.

In addition to the export market, there are opportunities to transport coal competitively to the southeastern states and to provide greater access to coal from Appalachia. Even southern Illinois coal producers have become interested—slurry lines would open new markets for the high sulfur coal mined in that area, and which mostly moves by barge down the Mississippi River.

Railroad arguments against coal slurry pipelines getting the right of *eminent domain* are not as strong now that railroads have been deregulated, STA spokesmen say. That deregulation plus some big mergers—such as the recent CSX merger (C&O-B&O with the "Family Lines" of SCL, L&N, etc.) and the forthcoming Southern Railway-Norfolk & Western Railway—has eliminated much of the rail competition in the southeastern U.S. Without competition, there is little effective price moderation available on transportation costs.

With growing support from all areas

of the nation, increased emphasis on coal production and utilization (and export), greater public awareness of the need for competition in the transportation area, and an improved economic and political climate, concrete results are expected in the legislative area this year, says STA.

It can't be too soon. The current project scorecard for coal slurry pipelines shows 10 projects in the U.S. plus one proposed in Canada. These planned, proposed, and under study lines total 10,716 miles. The accompanying table gives details.

Energy Transportation System, Inc. continues to forge ahead with its plans to get construction underway in 1983 and to have the line completed by 1985, at which time it will begin transporting some 37 million tons of coal per year from Wyoming to points in Oklahoma, Arkansas, and Louisiana.

ETSI has set up field offices in Kansas, Nebraska, and Wyoming to purchase right-of-way options. Similar operations will begin soon in the other states traversed by the pipeline.

Bechtel Petroleum, Inc. of Houston

U.S. & Canadian Coal Slurry Pipelines

Company	Miles	Sizes (In.)	From	To	Estimated Cost (\$Millions)	Status	Contractor or Engineering Co.	Annual Tonnage
Alberta Economic Development, Energy & Natural Resources Ministries	500	Unk.	Hinton, Alberta	West Coast Port	-	Planned	Fluor (E)	N.A.
Allen-Warner Valley Energy Systems (Nevada Power Co.)	253	20,24	Alton, Utah	Las Vegas Nev.	\$270	Planned	-	11.6 mm
Coalstream Pipeline Co. (Continental Resources Inc.)	1500	24-48	Kentucky	Florida	\$3000	Planned	Fluor (E)	55 mm
Energy Transportation Systems Inc.	1400	38	Wyoming	Baton Rouge La.	\$2000	Planned	Bechtel (E)	37 mm
Pacific Bulk Transportation Systems (Boeing Engineering & Construction Co.)	650		Emory, Carbon counties, Utah	Port Hueneme, Calif.	\$500	Planned	Boeing (E)	10 mm
Powder River Pipeline Inc.	1923	42	S.E. Montana	Great Lakes areas, other terminals	\$1260	Planned	-	36 mm
San Marco Pipeline Co. (Houston Natural Gas, Rio Grande Industries)	900	20, 24	S.E. Colorado	Texas Gulf Coast	\$800	Planned	-	15 mm
Ssnake River System (N.W. Energy, Gulf Interstate)	1100	20, 24	N.E. Wyoming	Idaho, Oregon	\$500	Planned	-	10 mm
Tesoro Petroleum Corp.	1000	30	Kentucky	Southeastern U.S.	\$1000	Planned	-	N.A.
Virginia Electric Power Co.	300	12-36	Proud, W.V.	Portsmouth, Va.	\$250	Planned	-	10 mm
Wytex System (Texas Eastern, Brown & Root)	1260	36,40	Powder River basin, Wyo.	Houston area	\$1800	Planned	Brown & Root (E)	22 mm

has been named by ETSI to carry out Phase Two (the definitive phase) of the 1400-mile project. This phase, representing a commitment of some \$70 million, includes completion of the right-of-way acquisition, design and engineering work, and a coal evaluation program. The project ultimately is expected to cost more than \$2 billion - largest ever undertaken in the Lower 48.

Under construction at Arkansas Power & Light Co.'s White Bluff generating station is a demonstration plant to evaluate the materials and processes that ETSI expects to use in building the line. The White Bluff plant will test major components, including front-end processes for coal slurry preparation and tail-end processes for dewatering, drying, coal handling and storage, as well as a test loop to evaluate pipeline and pumping equipment.

The plant will include a water treatment facility to demonstrate that the pipeline's wastewater can be treated to produce water acceptable for discharge or reuse according to local water quality standards.

Participation in the ETSI project expanded early in 1981 as Texas Eastern Corp.'s subsidiary, Texas Eastern Slurry Transport Co. joined the other four partner companies (Atlantic Richfield, Bechtel, Lehman Brothers Kuhn Loeb, and Kansas-Nebraska Natural Gas) in ownership; Texas Eastern acquired the 20% interest formerly held by United Energy Resources. Texas Eastern indicated that it intended to continue to examine other slurry pipeline projects.

Powder River Pipeline Inc., a new Montana firm, has announced plans for a 1923-mile, \$1.26 billion coal slurry pipeline project to serve the upper Midwest and provide markets for coal from southeastern Montana. PRPI's 42-in. line would transport coal from mines in the Powder River basin in Montana and Wyoming for power generating plants in Minnesota, Wisconsin, Illinois, and Iowa.

As initially proposed, the main slurry pipeline would be laid along an abandoned railroad right-of-way. The line would terminate in Milwaukee and have branches to Duluth, in western Iowa, and in southern Wisconsin and north central Illinois. An alternative proposal would involve delivering coal to a port on the west side of Lake Michigan for barge transport of coal to Michigan utilities.

Coalstream Pipeline Co. has been formed as a new subsidiary of Continental Resources Co. to build and operate a proposed coal slurry line connecting eastern coal fields with markets in Georgia and Florida. The 1500-mile line would be designed to transport up to 55 million tons per year from Illinois and Appalachian fields. Also under consideration is a coal exporting facility somewhere along the Southeast Atlantic coast that could deliver 10 million tons of coal annually for export to foreign markets.

Coalstream's system, involving lines ranging from 16 to 36-in. diameter, would cost approximately \$3 billion by the time it was completed.

Alberta Ministries of Economic De-

velopment, Energy, and Natural Resources have awarded a contract to a consortium that includes Fluor Canada Ltd., Fluor Ocean Services, Inc., Houston, and Pipeline Systems, Inc., San Francisco, to study the feasibility of transporting Alberta coal over 500 miles by slurry pipeline from Hinton, Alberta (about 50 miles northeast of Jasper) to a West Coast Canadian port facility (probably near Vancouver). Thermal coal to be transported most likely would be exported. Alberta government officials said that consideration of a coal slurry pipeline was brought about by high transportation costs by rail that have inhibited expanding opportunities to market thermal coal.

Other major projects (see table) continue to be studied and developed as prudently as possible.

Major impediments, in most cases, are acquisition of rights to water sources, acquisition of rights-of-way (federal legislation will help eliminate this problem), preparation of environmental impact statements, and attracting financing.

Engineering techniques for the design and construction of slurry pipelines have been developed and proven. Technology is not a question today.

Proponents of slurry pipelines are confident that—as the need for competitive coal transportation grows—slurry pipelines will become abundant and prove a major economics force. They will also contribute heavily to the changing energy flow patterns predicted for the 1980s and 1990s. **P&GJ**

"Big Oil" Takes it on the Chin

by Greg Martin, Editor, ENERGY NEWS/ENERGY WEEK

First quarter earnings of 62 oil companies plunged 13.6% from first quarter of 1980, dragged down by heavy losses in the refining sector of integrated companies. Income continued to rise for independent producers, boosted by the final increment of U.S. crude oil decontrol on Jan. 28. The profit margin for the entire group fell from 6.9% to 5.2%.

"Big Oil" took it on the chin as refiners were forced to cut prices to try to get rid of bulging product inventories. In the weakening market for gasoline, refiners couldn't raise prices enough to recoup rising costs of crude oil.

Some refiners found themselves buying OPEC crude for \$4/bbl more than the selling price of refined product yields. Those without oil/gas production, like Ashland, Clark Oil and Tosco, suffered most.

Income declines, of course, were relative to record earnings in first quarter 1980. Majors like Standard Indiana, Gulf and Conoco saw big refining/marketing profits in that quarter turn to big losses in 1981's first quarter.

Texaco shook a 10% earnings gain out of inventories. It needs less product to supply its customers after closing part of its retail markets. Standard Ohio's gain was

due to higher prices for Alaskan crude oil; Standard California credited higher prices for crude and natural gas.

"A free market does not quickly absorb sudden cost increases when demand is weak," said Robert Anderson, chairman, Atlantic Richfield. W. C. Douce, head of Phillips, noted: "The recent decline in the price of gasoline is evidence of the vigorous competition that is taking place."

Majors also had to pay sharply higher "windfall profits" tax (WPT) compared to first quarter 1980, when the tax was in effect only one

(Continued on page 8)

FIRST QUARTER GAS COMPANIES FINANCIAL REPORTS

	Three months ending March 31**						Profit Margin†	
	Revenues (\$000)			Earnings* (\$000)				
	1981	1980	% Chg.	1981	1980	% Chg.	1981	1980
Alabama Tennessee N.G.	34,064	26,778	+ 27.2	1,638	1,324	+ 23.7	4.8	4.9
American Nat. Resources	1,124,220	976,333	+ 15.1	61,254	54,160	+ 13.1	5.4	5.5
Arkansas Louisiana Gas	339,659	286,312	+ 18.6	34,432	35,898	- 4.1	10.1	12.5
Columbia Gas	1,439,821	1,302,382	+ 10.6	83,394	82,478	+ 1.1	5.8	6.3
Commonwealth Nat. Res.	76,846	70,207	+ 9.5	2,975	3,124	- 4.8	3.9	4.4
Consolidated Nat. Gas	1,043,042	953,206	+ 9.4	71,218	70,003	+ 1.7	6.8	7.3
ENSERCH Corp.	834,842	694,687	+ 20.2	58,354	45,290	+ 28.8	7.0	6.5
Equitable Gas	160,327	125,326	+ 27.9	20,660	16,680	+ 23.9	12.9	13.3
Houston N.G. ¹	719,477	586,632	+ 22.7	61,807	49,295	+ 25.4	8.6	8.4
InterNorth	1,142,615	938,396	+ 21.8	116,957	111,114	+ 5.3	10.2	11.8
Mountain Fuel Supply	146,557	129,025	+ 13.6	14,575	14,950	- 2.5	9.9	11.6
ONEOK Inc.	333,877	280,206	+ 19.2	21,239	20,929	+ 1.5	6.4	7.5
Peoples Energy	1,234,686	1,075,862	+ 14.8	88,770	66,242	+ 34.0	7.2	6.2
Pioneer Corp.	288,155	210,483	+ 36.9	29,198	23,430	+ 24.6	10.1	11.1
Southern Nat. Resources	678,054	553,782	+ 22.4	47,348	37,050	+ 27.8	7.0	6.7
Texas Eastern Corp.	1,154,547	1,086,711	+ 6.2	62,608	61,258	+ 2.2	5.4	5.6
Texas Gas Transmission	683,164	585,333	+ 16.7	31,628	25,073	+ 26.1	4.6	4.3
TransCanada PipeLines	961,533	782,892	+ 22.8	25,955	22,050	+ 17.7	2.7	2.8
Transco Companies	865,190	586,235	+ 47.6	31,386	28,357	+ 10.7	3.6	4.8
Union Gas Ltd.	315,794	260,352	+ 21.3	16,532	15,485	+ 6.8	5.2	5.9
United Energy Resources	1,264,076	1,034,782	+ 22.2	55,404	41,702	+ 32.9	4.4	4.0
Westcoast Transmission	371,903	436,986	- 14.9	15,927	11,920	+ 33.6	4.3	2.7
TOTAL	15,212,449	12,982,098	+ 17.2	953,259	837,812	+ 13.8	6.3	6.5

*Earnings available to common. **Excluding non-recurring items. †Earnings* divided by Revenues.

¹Three months ending January 31.

FIRST QUARTER OIL COMPANIES FINANCIAL REPORTS

Three months ending March 31**									
		Revenues (\$000)			Earnings* (\$000)			Profit Margin†	
		1981	1980	% Chg.	1981	1980	% Chg.	1981	1980
1.	Adobe Oil	39,305	39,221	+ 0.2	5,156	5,068	+ 1.7	13.1	12.9
2.	Alaska Interstate	91,278	56,735	+ 60.9	17,946	14,221	+ 26.2	19.7	25.1
3.	Amerada Hess	2,969,215	2,325,398	+ 27.7	174,536	198,978	- 12.3	5.9	8.6
4.	American Petrofina	666,473	523,374	+ 27.3	20,250	31,410	- 35.5	3.0	6.0
5.	American Quasar	13,716	10,085	+ 36.0	650	2,242	- 71.0	4.7	22.2
6.	Arapaho Petroleum ¹	14,401	5,517	+161.0	112	142	- 21.1	2.6	4.5
7.	Argo Petroleum	4,160	3,229	+ 28.8	645	474	+ 36.1	15.5	14.7
8.	Ashland Oil	2,153,998	2,040,159	+ 5.6	715	42,262	- 98.3	0.03	2.1
9.	Atlantic Richfield	7,132,320	5,461,176	+ 30.6	346,484	427,017	- 18.9	4.9	7.8
10.	Belco Petroleum	232,684	211,543	+ 10.0	26,246	18,243	+ 43.9	11.3	8.6
11.	Buttes Gas & Oil	37,630	40,217	- 6.4	2,943	3,186	- 7.6	7.8	7.9
12.	Callon Petroleum ¹	2,123	1,578	+ 34.5	238	384	- 38.0	11.2	24.3
13.	Clark Oil & Refining	403,708	402,274	+ 7.1	(4,469)	14,100			3.5
14.	Commonwealth Oil Ref.	304,569	306,243	- 0.5	(22,348)	(6,700)			
15.	Consolidated O&G	11,537	8,141	+ 29.4	1,982	94	+2008.5	17.2	1.2
16.	Conoco	5,396,200	4,300,000	+ 24.6	250,900	328,600	- 23.6	4.6	7.6
17.	Crown Central Petr.	379,080	306,230	+ 23.8	(10,228)	11,478			3.7
18.	Crystal Oil	75,874	58,321	+ 30.1	(1,573)	2,887			5.0
19.	Delhi Int'l Oil	7,919	5,596	+ 41.5	1,181	981	+ 20.4	14.9	17.5
20.	Diamond Shamrock	864,968	755,331	+ 14.5	48,037	56,255	- 14.6	5.6	7.4
21.	Discovery Oil	1,379	446	+209.2	102	(14)		7.4	
22.	Dorchester Gas ¹	151,874	174,778	- 13.1	6,631	7,583	- 12.6	4.4	4.3
23.	Dyco Petroleum	10,579	6,396	+ 65.4	2,956	1,610	+ 83.6	27.9	25.2
24.	Exxon	30,323,000	27,654,000	+ 9.7	1,600,000	1,925,000	- 16.9	5.3	7.0
25.	Felmont	19,047	11,948	+ 59.4	4,952	3,749	+ 32.1	26.0	31.4
26.	Forest	31,094	21,464	+ 44.9	2,282	2,123	+ 7.5	7.0	10.0
27.	Getty Oil	3,294,621	2,268,699	+ 45.2	229,930	225,548	+ 1.9	7.0	9.9
28.	Gulf Oil Corp.	7,874,000	7,753,000	+ 1.6	303,000	389,000	- 22.1	3.8	5.0
29.	Howell Petroleum	22,179	4,381	+406.3	1,924	862	+123.2	8.7	19.7
30.	Inexco Oil	52,898	31,720	+ 66.8	6,345	5,747	+ 10.4	12.0	18.1
31.	Kerr-McGee Corp.	916,126	780,394	+ 17.4	43,337	47,142	- 8.1	4.7	6.0
32.	Louisiana L&E	322,802	264,954	+ 21.8	50,562	51,593	- 2.0	15.7	19.5
33.	Mapco Inc.	580,021	378,811	+ 53.1	25,435	31,296	- 18.7	4.4	8.3
34.	Marathon Oil	2,424,098	2,265,368	+ 7.0	69,775	139,071	- 49.8	2.9	6.1
35.	McFarland Energy	3,985	3,389	+ 17.6	1,175	1,065	+ 10.3	29.5	31.4
36.	Mesa Petroleum	103,624	106,930	- 3.1	29,841	19,913	+ 49.9	28.8	18.6
37.	Mobil Corp.	17,095,000	15,278,000	+ 11.9	640,000	846,000	- 24.3	3.7	5.5
38.	Murphy Oil	666,806	569,245	+ 17.1	38,430	28,390	+ 35.4	5.8	5.0
39.	Natomas	369,348	294,214	+ 25.5	58,237	48,015	+ 21.3	15.8	16.3
40.	Noble Affiliates	87,503	67,584	+ 29.5	10,850	13,459	+ 34.1	20.6	19.9
41.	Occidental Petroleum	3,379,600	3,346,600	+ 10.0	259,400	277,900	- 6.7	7.7	8.3
42.	Pacific Resources	231,382	206,960	+ 11.8	(1,380)	9,030			4.4
43.	Patrick Petroleum ²	18,634	12,376	+ 50.6	1,304	574	+127.2	7.0	4.6
44.	Pennzoil Co.	687,988	612,905	+ 12.3	59,123	82,501	- 28.3	8.6	13.5
45.	Phillips Petroleum	4,228,469	3,384,162	+ 24.9	270,784	284,414	- 4.8	6.4	8.4
46.	Quaker State	218,157	194,860	+ 12.0	3,636	6,879	- 47.1	1.7	3.5
47.	Shell Oil	5,413,000	4,798,000	+ 12.8	361,000	373,000	- 3.2	6.7	7.8
48.	Southland Royalty	95,680	90,635	+ 5.6	10,248	18,800	- 45.5	10.7	20.7
49.	Standard California	11,988,000	10,447,000	+ 14.8	660,000	627,000	+ 5.3	5.5	6.0
50.	Standard Indiana	7,853,100	6,450,900	+ 21.7	376,700	576,000	- 34.6	4.8	8.9
51.	Standard Ohio	3,119,300	2,658,700	+ 17.3	520,400	450,700	+ 15.5	16.7	17.0
52.	Statex Petroleum	2,504	1,243	+101.4	589	186	+216.7	23.5	15.0
53.	Sun Co.	4,000,000	3,100,000	+ 29.0	120,000	251,000	- 52.2	3.0	8.1
54.	Superior Oil	492,906	330,287	+ 49.2	107,960	90,566	+ 19.2	21.9	27.4
55.	Tenneco	3,809,000	3,316,000	+ 14.9	194,000	178,000	+ 9.0	5.1	5.4
56.	Tesoro	841,574	823,265	+ 2.2	23,273	36,155	- 35.6	2.8	4.4
57.	Texaco Inc.	15,453,000	13,248,900	+ 16.6	658,000	600,600	+ 9.6	4.3	4.5
58.	Texas Oil & Gas	389,659	294,901	+ 32.1	47,874	34,783	+ 37.6	12.3	11.8
59.	Tosco Corp.	762,429	534,162	+ 42.7	(38,688)	22,629			4.2
60.	Tribune Oil	563	472	+ 19.3	164	191	- 14.1	29.1	40.5
61.	Union California	2,666,458	2,375,612	+ 12.2	154,479	152,922	+ 1.0	5.8	6.4
62.	Woods Petroleum	16,377	11,968	+ 36.8	4,667	3,065	+ 52.3	28.5	25.6
TOTAL		150,818,922	131,035,997	+ 15.1	7,785,900	9,015,369	- 13.6	5.2	6.9

*Earnings available to common. **Excluding non-recurring items. () Loss. †Earnings* divided by revenues. ¹Ends February 28, 1981 and February 29, 1980. ²Third quarter ends January 31, 1981.

month. Standard California said its \$377 million WPT payments were higher than for all of 1980.

Other WPT totals: Exxon, \$584 million; Standard Indiana, \$532.4 million; Atlantic Richfield, \$449 million; Shell, \$387 million; Gulf, \$327 million; Texaco, \$319.2 million; Mobil, \$249 million; Union California, \$139.5 million.

In times of controlled prices, the lost margins of profit could be "banked" for later recovery. Now, refiners must find a way out.

Nonetheless, refiners' outlook for the rest of 1981 is not that bleak. Standard Indiana, Union California and Conoco still expect improvement over 1980, as refiners absorb major capital expenditures for refinery modifications and the full impact of oil price decontrol.

Clark Oil says consumer resistance to higher product prices is putting pressure on crude oil producers to lower prices. "We expect some degree of price improvement for the balance of 1981, and further margin

improvements will be realized." Tosco expects "further strengthening over the rest of the year." Pacific Resources anticipates "a strong second half as product prices and markets strengthen."

Independent producers will show big earnings gains this year—but they'll also be saddled with big WPT payments.

Gas company results were mixed. Net income for the group as a whole rose 13.8% over first quarter 1980, but revenue gains outstripped earnings as rising costs of natural gas were passed through to end users. The group's profit margin dipped from 6.5% to 6.3%.

As in 1980, gas companies derived an increasing share of earnings from nonregulated operations — oil/gas exploration and production, gas processing, contract drilling.

Exploration/production earnings for InterNorth rose 167% over previous year's first quarter. Tax credits from InterNorth's investment in Northern Border Pipeline project also helped.

Impetus behind ENSERCH's record first quarter earnings came from exploration/production and oilfield services segments, as gas transmission and distribution income fell. Nonutility business also was the main factor in ONEOK's increased earnings.

Contract drilling operations were largely responsible for Peoples Energy Corp.'s income gain, offset by weak industrial gas markets and higher operating and financing costs.

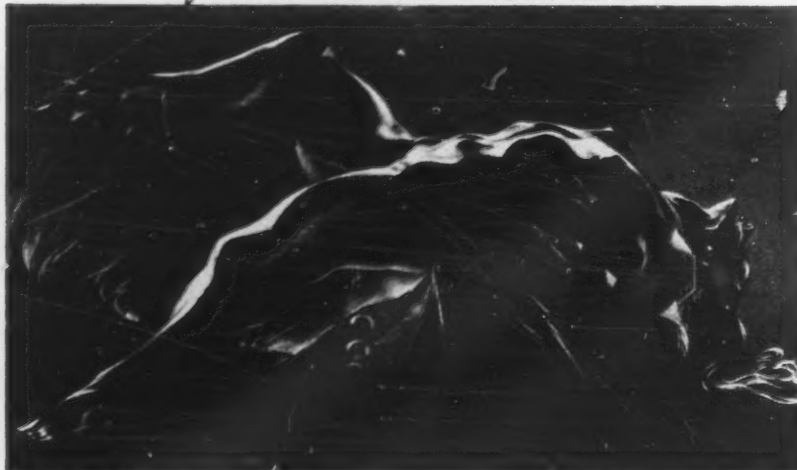
Columbia Gas benefited from "increased sales of oil, gas, propane and other hydrocarbons." Income would have been greater except for reduced industrial gas sales and loss of equity earnings on the LNG facility at Cove Point, MD.

Mountain Fuel Supply's utility operations had lower income, but oil/gas earnings were sharply higher due to decontrol.

All segments of Southern Natural Resources showed big earnings gains: Gas pipeline operations up 25%, exploration/production up 71%, contract drilling up 121%.

All units of United Energy Resources contributed to record first quarter earnings. United's pipeline system had its lowest level of gas curtailments in recent history. ■

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